

CLAIMS:

1. A data structure realized in a database comprising:

5 a plurality of data areas in which given time series data pieces are loaded in sequence of times; and bookmark information areas respectively provided at predetermined locations in said plurality of data areas and each having a pair of bookmark information indicative of a time corresponding to a time series data piece loaded
10 in each of said data areas and state transition information indicative of a state of the data piece in each data area, said state transition information being allowed to have one of a value indicative of an online state in which the data area is permitted to be retrieved and a value indicative of
15 a loading state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved.

2. A data structure according to claim 1, wherein
a said plurality of data areas ~~have~~ ^{have} each a predetermined data
20 capacity and are arranged consecutively in said database in
a order that said ~~plurality of~~ bookmark information areas in said plurality of data areas can be read consecutively.

3. A data structure according to claim 1, wherein the state transition information in at least one of said
25 plurality of data areas is allowed to have one of a value indicative of an online state in which the data area is permitted to be retrieved, a value indicative of a loading

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state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved and a value indicative of a state in which data in the data area is empty.

4. A data structure realized in a database comprising:

a plurality of data areas in which given time series data pieces are loaded at predetermined locations, respectively, in said database in sequence of times; and predetermined bookmark information areas each having a pair of bookmark information indicative of a time corresponding to a time series data piece loaded in each of said data areas and state transition information indicative of a state of the data piece in each data area, said state transition information having one of a value indicative of an online state in which the data area is permitted to be retrieved and a value indicative of a loading state in which loading of data in each data area has not yet been completed and the data area is not permitted to be retrieved.

5. A data structure according to claim 4, said plurality of data areas have each a predetermined data capacity and are arranged consecutively in said database in order that said plurality of bookmark information areas in said plurality of data areas can be read consecutively.

6. A data structure according to claim 4; wherein the state transition information in at least one of said plurality of data areas has a value indicative of an online

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state in which the data area is permitted to be retrieved,
a value indicative of a loading state in which loading of
data in the data area has not yet been completed and the
data area is not permitted to be retrieved and a value
5 indicative of a state in which data in at least one data
area is empty.

7. A database managing method for managing data in a
database, comprising the steps of:

adding, to a predetermined location in a given
10 time series data piece for a predetermined time, bookmark
information having bookmark information indicative of a
time corresponding to said time series data piece for said
predetermined time and state transition information
indicative of a state of said time series data piece for
15 said predetermined time;

providing, as said state transition information,
one of a value indicative of an online state in which the
data area is permitted to be retrieved, a value indicative
of a loading state in which loading of data in the data
20 area has not yet been completed and the data area is not
permitted to be retrieved and a value indicative of a state
in which data in the data area is empty; and

loading time series data pieces for predetermined
times in a plurality of data areas in said database in
25 sequence of times corresponding to said time series data
pieces.

8. A database managing method according to claim 7,
further comprising the steps of:

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reading, from said plurality of data areas, a plurality of bookmark information pieces each having state transition information and bookmark information in accordance with a data retrieval request applied to said
5 database by designating a time; and

detecting the bookmark information including said designated time and when the state transition information included in said detected bookmark information indicates said online state, reading a time series data piece
10 corresponding to said detected bookmark information.

a 9. A database managing method according to claim 7,
further comprising the step of:

when the state transition information included in said detected bookmark information indicates either a value
15 indicative of said loading state or a value indicative said empty state, determining that said data retrieval request is not responded to.

a 10. A database managing method according to claim 7,
further comprising the steps of:

20 reading, from said plurality of data areas, a plurality of bookmark information pieces each having state transition information and bookmark information in accordance with a data deletion request applied to said database by designating a time; and

25 detecting the bookmark information including said designated time and when the state transition information included in said detected bookmark information indicates said online state, setting a value indicative of an empty

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state in said state transition information included in said detected bookmark information.

11. A database managing method according to claim 7, further comprising the steps of:

~~cumulating repeatedly applied time series data pieces in a cumulative data storage area until they reach total data for said predetermined time, and~~

~~after said repeatedly applied time series data pieces have been collected up to said total data for said predetermined time, adding, to a data piece in said cumulative data storage area, bookmark information having bookmark information indicative of a time corresponding to the data piece for said predetermined time and state transition information indicative of a state of said time series data piece for said predetermined time and loading resulting data pieces in said plurality of data areas of said database in sequence of times corresponding to said time series data pieces.~~

12. A database managing method for managing data in a database, comprising the steps of:

~~adding, to a predetermined location in a given time series data piece for a predetermined time, bookmark information having bookmark information indicative of a time corresponding to said time series data piece for said predetermined time and state transition information indicative of a state of said time series data piece for said predetermined time and start area information having a~~

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flag indicating whether the area is the final one of a plurality of areas in said database and an address area for setting an address;

providing, as said state transition information,
5 one of a value indicative of an online state in which the data area is permitted to be retrieved and a value indicative of a loading state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved;

10 loading time series data pieces for predetermined times in a plurality of consecutive data areas in said database in ^a sequence of times corresponding to said time series data pieces; and

raising said flag of start area information in
15 the final one of said plurality of consecutive data areas and setting an address of first one of said plurality of consecutive data areas in said address area.

13. A database managing method according to claim 12 further comprising the steps of:

20 adding, to a predetermined location in a time series data piece for a predetermined time applied so as to be loaded in said database, bookmark information having bookmark information indicative of a time corresponding to said time series data piece for said predetermined time and
25 state transition information indicative of a state of said time series data piece for said predetermined time;

reading all state transition information pieces in said database to detect bookmark information having the

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oldest time and loading said time series data piece for said predetermined time applied so as to be loaded in said database in a data area corresponding to said oldest bookmark information; and

5 updating said oldest bookmark information to said bookmark information corresponding to said loaded data.

11. A database managing method for managing data in a database, comprising the steps of:

reading bookmark information having bookmark
10 information indicative of a time corresponding to a given time series data piece for a predetermined time and state transition information indicative of a state of said time series data piece for said predetermined time from a predetermined bookmark area and setting the state of said
15 time series data piece in said state transition information to a value indicative of a state in which data is empty so as to write said bookmark information in said database;

loading given time series data pieces for given predetermined times in a plurality of data areas in said
20 database in sequence of times corresponding to said time series data pieces; and

~~after the step of loading said data pieces has~~
~~been completed,~~ writing bookmark information having
bookmark information indicative of a time corresponding to
25 a time series data piece for said predetermined time and state transition information indicative of an online state of said time series data piece for said predetermined time in said predetermined bookmark area.

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a 15. A database managing method according to claim 14,
further comprising the step of loading time series data
pieces for predetermined times in a plurality of data areas
in said database in sequence of times corresponding to said
5 time series data pieces.

P a 16. A database managing method according to claim 15,
further comprising the steps of:

reading, from said plurality of data areas, a
plurality of bookmark information pieces each having state
10 transition information and bookmark information in
accordance with a data retrieval request applied to said
database by designating a time; and

detecting the bookmark information including said
designated time and when the state transition information
15 included in said detected bookmark information indicates
said online state, reading a time series data piece
corresponding to said detected bookmark information.

a 17. A database managing method according to claim 14,
further comprising the step of:

20 when the state transition information included
in said detected bookmark information indicates either a
value indicative of said loading state or a value
indicative of said empty state, determining that said data
retrieval request is not responded to.

a 25 18. A database managing method according to claim 14,
further comprising the steps of:

reading, from said plurality of data areas, a
plurality of bookmark information pieces each having state

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transition information and bookmark information in accordance with a data deletion request applied to said database by designating a time; and

detecting the bookmark information including said
5 designated time and when the state transition information included in said detected bookmark information indicates said online state, setting a value indicative of said empty state in said state transition information included in said detected bookmark information.

10 19. A database managing method according to claim 14,
further comprising the steps of:

cumulating repeatedly applied time series data
pieces in a cumulative storage area until ^{the cumulative data} ~~they~~ reach total
data for said predetermined time; and

15 ~~after said repeatedly applied time series data~~
~~pieces have been collected up to said total data for said~~
~~predetermined time~~ adding, to a data piece in said
cumulative data storage area, bookmark information having
bookmark information indicative of a time corresponding to
20 said data piece for said predetermined time and state
transition information indicative of a state of said time
series data piece for said predetermined time and loading
resulting data pieces in said plurality of data areas in
said database in sequence of times corresponding to said
25 time series data pieces.

a 20. A database managing system, comprising:

a processor having a memory for storing given
time series data pieces for predetermined times and a clock

for reading times at which said time series data pieces are applied; and

5 a database connected to said processor and having bookmark information indicative of a time corresponding to a time series data piece for a predetermined time, state transition information indicative of a state of said time series data piece of said predetermined time and said time series data pieces for said predetermined times, said state transition information having one of a value indicative of
10 an online state in which the data area is permitted to be retrieved, a value indicative of a loading state in which loading of data in the data area has not yet been completed and the data area is not permitted to be retrieved and a value indicative of a state in which data in the data area
15 is empty.

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